



A11104 904175

NIST
PUBLICATIONSU.S. DEPARTMENT OF COMMERCE
National Institute of Standards and Technology

NISTIR 5716

Guidelines for the Development of Mapping Tables

Allison Barnard Feeney
Manufacturing Systems Integration Division
National Institute of Standards and Technology
Gaithersburg, MD 20899

Diane Craig
Product Data Integration Technologies
100 W. Broadway Suite 540
Long Beach, CA 90802

November 16, 1995

QC
100
.U56
NO. 5716
1995

NIST

[illegible]

Ronald Brown,
Secretary of Commerce

Mary L. Good,

National Institute of
Standards and Technology
Arati Prabhakar, Director

Allison Barnard Feeney
Manufacturing Systems Integrations Division
National Institute of Standards and Technology
Gaithersburg, MD 20899

Diane Craig
Product Data Integration Technologies
100 W. Broadway Suite 540
Long Beach, CA 90802

November 16, 1995



Contents	Page
1 Introduction	1
2 Application element column documentation	1
3 AIM element column documentation	3
3.1 Single AIM element	3
3.2 Multiple AIM elements	3
3.3 Path	4
3.4 Identical mapping	4
4 Source column documentation	4
5 Rules column documentation	5
6 Reference path column documentation	5
6.1 Symbolology	5
6.2 Application objects	8
6.3 Application attributes	8
6.4 Application assertions	8
6.5 AIC considerations	10

Annexes

A Example information requirements	11
B Example mapping table	14
C Bibliography	18
D Mapping table issues	19

1 Introduction

The mapping table is a pivotal component of an application protocol (AP). The mapping table documents the traceability of the application information requirements between the specification of these requirements in clause 4 of the AP and the application interpreted model (AIM) that documents how standardized constructs are applied to satisfy these requirements in clause 5. This document is intended to provide guidance to application protocol development teams on the creation of mapping tables. Additionally, this document may aid reviewers and implementors of APs in understanding mapping tables. This document describes the methodology for producing a complete mapping table, focusing on the development of the mapping table content. Specifics on style, format, boiler plate text, and other presentation issues are provided in the *Supplementary directives for the drafting and presentation of ISO 10303 (Supplementary directives)*. Additional guidance on other areas of AP development is found in the *Guidelines for development and approval of STEP application protocols*.

Each information requirement of an AP is mapped to one or more constructs in the AIM. Each of these mappings is documented on a single row of the mapping table. The mapping table is organized into sub-tables by unit of functionality (UoF) as defined in clause 4.1 of the AP. Each row is divided into five columns that provide the details of the mapping. The headings of the five columns are Application element, AIM element, Source, Rules, and Reference path. This document provides guidance on the development of each column of the mapping table.

To aid in the understanding of this document, several examples taken from ISO 10303-201:1994 (part 201) are included within the body of this text. Additionally, a more comprehensive example is provided in the annexes of this document. In the example shown in annexes A and B, four application objects have been chosen from one of the UoFs in part 201. Annex A contains the descriptions of the UoF, the application objects, and the application assertions as normatively documented in clause 4 of part 201. Annex B contains the mapping table for the application objects and assertions in annex A. Throughout the body of this text, references to application elements in examples are presented with leading capitals and underscores between the words. References to AIM elements in examples are presented in bold face with underscores between words, but no leading capitals.

2 Application element column documentation

The Application element column lists the application objects (i.e., entities and attributes) and assertions from clause 4 of the AP in accordance with the guidance provided in the *Supplementary directives*. Each application element from the application protocol appears at least once in the table. An application object may appear in more than one UoF within an AP. When this occurs, the sub-table for each UoF documents the mapping of that element within the context of that UoF.

The requirements of the application protocol may define more than one assertion between two application objects. When this occurs, each assertion is entered on a separate row of the mapping table. The heading of the application assertion from clause 4.3 of the AP is used for each entry along with an identifying phrase. The phrase is chosen from the normative text of the assertion and is placed in parentheses following the assertion heading. The assertions appear in the mapping table in the order that they are defined in clause 4.3

of the AP. **Figure 1** illustrates how three assertions between a pair of application objects are documented in the first column of a mapping table.

4.3.67 Structured_dimension_callout to Text_string

Each Structured_dimension_callout has as a dimension value one or more Text_string objects. Each Text_string may be the dimension value for exactly one Structured_dimension_callout.

Each Structured_dimension_callout has as a tolerance value zero, one, or many Text_string objects. Each Text_string may be the tolerance value for exactly one Structured_dimension_callout.

Each Structured_dimension_callout has as unit text zero, one, or many Text_string objects. Each Text_string may be the unit text for exactly one Structured_dimension_callout.

Application element	
STRUCTURED_DIMENSION_CALLOUT	
structured_dimension_callout to text_string (as dimension value)	
structured_dimension_callout to text_string (as tolerance value)	
structured_dimension_callout to text_string (as unit text)	

Figure 1 - Example of multiple assertions

When an application object maps to different AIM objects in different contexts, often the mappings can be clearly documented only through the use of numbered alternatives within the row of the mapping table. In these cases, the application element column contains numbered descriptions that indicate when the alternative mappings apply. In the succeeding columns of the table, the AIM elements and reference paths are numbered correspondingly. In practice, when there are multiple mappings for an application object, these mappings are frequently self-explanatory. However, mappings of assertions involving this object and attributes of this object generally require the numbered descriptions. **Figure 2** shows alternative mappings for an application object that requires clarification. In the example in annex B, the entity Organization has multiple mappings, though numbered alternatives are only provided for the mappings of the Organization_name attribute and the assertion from Approval to Organization.

Application element	AIM element	Source
ANNOTATION_SUBFIGURE_DEFINITION_ELEMENT	#1 (draughting_annotation_occurrence)	201
#1: If the element is a curve, fill area, symbol, subfigure, or text #2: If the element is a dimension or a draughting callout	#2 (draughting_elements)	201
annotation_subfigure_definition_element to draughting_annotation	IDENTICAL MAPPING	

Figure 2 - Example of alternative mappings

3 AIM element column documentation

The AIM element column contains the description to which the application element from the preceding column maps. Application objects map to either a single AIM element, a combination of multiple AIM elements, or a choice among multiple AIM elements. AIM elements are entities or attributes from resource models (i.e., integrated resources or application interpreted constructs) or entities that are defined in the AIM of the AP being mapped. The AIM element column for an application assertion is populated with the word “PATH” or the words “IDENTICAL MAPPING”. These mappings are described in the following subsections.

3.1 Single AIM element

Application objects may map to entities or attributes from the integrated resources, application interpreted constructs, or entities created within the AIM short form. When the mapping is to an entity, the entity name appears in the AIM element column. When the mapping is to an attribute, the AIM element column contains the entity name where the attribute is defined, followed by a period, followed by the attribute name.

3.2 Multiple AIM elements

Sometimes a single application object maps to more than one AIM element. When this occurs, each mapping is documented in the mapping table. This may occur as an “and” situation (both AIM elements must be present) or an “or” situation (either AIM element may be present). In an “and” mapping, multiple AIM elements are required to satisfy the information requirement. Square brackets “[]” are placed around each required AIM element to denote the “and” situation. In an “or” situation, multiple AIM elements are alternatives that satisfy the information requirements. Parentheses “()” are placed around each alternative AIM element to denote the “or” situation. Often, the alternatives in an “or” situation are numbered to reflect descriptions provided in the application element column. Parentheses and brackets may be used in combination to indicate the mapping of compound “and”/“or” situations.

For an example of an attribute with multiple mappings, see the Organization_name attribute of the Organization application object in annex B. In this mapping, how the requirement for a name is satisfied depends on whether the organization is satisfied as a person, an organization, or a person within an organization and is thus indicated by parentheses. When a person within an organization is required, the name

is satisfied by both the identification of the person and the name of the organization as indicated by the square brackets.

3.3 Path

The AIM element column of a mapping table contains the word “PATH” when the application element is an application assertion and the application objects in the assertion map to different AIM elements. The reference path for an application assertion is designed to show how the relationship between the application objects is satisfied in the AIM.

3.4 Identical mapping

The AIM element column of a mapping contains the words “IDENTICAL MAPPING” when the application element is an application assertion and both application objects in the assertion map to the same AIM element (see Figure 3). Such cases may arise when there is a high level of detail in the application reference model (ARM) or the constructs in the integrated resources are more semantically rich than the constructs in the ARM.

Application element	AIM element	Source
ANNOTATION_SUBFIGURE_DEFINITION_ELEMENT #1: If the element is a curve, fill area, symbol, subfigure, or text #2: If the element is a dimension or a draughting callout	#1 (draughting_annotation_occurrence) #2 (draughting_elements)	201 201
annotation_subfigure_definition_element to draughting_annotation	IDENTICAL MAPPING	
DRAUGHTING_ANNOTATION #1: If the annotation is a curve, fill area, symbol, subfigure, or text #2: If the annotation is a dimension or a draughting callout	#1 (draughting_annotation_occurrence) #2 (draughting_elements)	201 201

Figure 3 - Example of an identical mapping

4 Source column documentation

The Source column contains an ISO 10303 part number for each AIM element provided in the preceding column. In general, the part number is the part of ISO 10303 in which the AIM element is defined. The part numbers referenced in a mapping table may correspond to an integrated resource (IR); an application interpreted construct (AIC); or the application protocol itself, in the case where the AIM element is an AP created specialization of an integrated resource entity. When an application object or assertion is mapped to an entity or type that is defined in the integrated resources, implicitly or explicitly brought into the scope of an AIC according to the interfacing rules of the *EXPRESS language reference manual* (ISO 10303-11:1994),

and the mapping is within the context of the AIC, the AIC part number is referenced in the source column. If the mapping is not within the context of the AIC, the part number of the integrated resource construct is referenced in the source column.

If the AIM element column contains either the word “PATH” or the words “IDENTICAL MAPPING”, no source document is listed in the source column.

5 Rules column documentation

The Rules column of the mapping table contains numerical references to the global rules in the AIM short form that constrain the mappings. The numerical references correspond to a numbered list of all global rules in the AP. That list follows the mapping table. In this list, the rules shall appear in the same order as in clause 5.2.3 of the AP. There may be more than one rule constraining a given mapping. Some mappings may be unconstrained. Rules restricting instantiation of entities within the AIM are to be included in the mapping table only when the mapping is to an AIM element that shall not be independently instantiable. When an entity constrained by an instantiability rule appears in a reference path, that mapping assumes that the entity will be instantiated in the context of other entities; therefore, the reference to the rule is not needed for that mapping. All rules that are created in the AP short form, with the exception of entity instantiability rules, must be referenced in the mapping table at least once.

6 Reference path column documentation

The reference path illustrates how the requirements and relationships stated in clause 4 of the AP are maintained as a result of the application interpretation process. It specifies the complete path of entity references in the AIM that is needed to represent the information requirements of the ARM. A set of symbols and formats were developed to construct a consistent syntax for documenting reference paths. Reference path syntax is consistent for each type of application element. The intent of the current syntax is to facilitate human readability of the mapping table. In the future, this syntax may be extended to improve computer readability of the mapping table. This section discusses the symbology used in documenting reference paths as well as reference path requirements for each type of application element.

6.1 Symbology

A reference path specification is contained within a single cell in the reference path column of the mapping table and is read from top to bottom. Each line of the reference path specification may contain symbols to illustrate the EXPRESS structure of the AIM objects. Understanding the symbology used in the reference path specification is the key to reading and writing mapping tables.

6.1.1 Delimiter symbols

The delimiter symbols are used to indicate the relationship of the specified entity or attribute preceding the symbol to the specified entity or attribute following the symbol. The symbol should be placed at the end of

the line, so that the name of the following entity or attribute is at the beginning of the next line. The meaning of these symbols can be paraphrased as:

=> :	"is a supertype of"
<= :	"is a subtype of"
-> :	"references"
<- :	"is referenced by"

The "=>" and "<=" symbols indicate a supertype or subtype structure. The "=>" symbol is used to indicate that the specified entity preceding the symbol is the supertype of the entity specified on the next line. The "<=" symbol is used to indicate that the specified entity preceding the symbol is a subtype of the entity specified on the next line.

The "->" and "<-" symbols indicate the reference to an entity or type by an attribute. The "->" symbol is used to indicate that the specified attribute preceding the symbol references the entity or type specified on the next line. The "<-" symbol is used to indicate that the specified entity or type preceding the symbol is referenced by the attribute specified on the next line.

When an entity name appears on a line that is terminated without the use of one of the above symbols, this may indicate that the specified entity has the attribute shown on the next line. When an attribute name appears on a line that is terminated without the use of one of the above symbols, this may indicate that the specified attribute is an attribute of the entity shown on the next line. A new line is used without conveying additional semantics before and after lines where a select type value is provided. A new line also terminates the reference path.

Reference path lines that are too long to fit within the table cell can be split using the forward slash symbol "/". The symbol conveys no additional meaning within the reference path. The "/" is positioned between elements of the line, preferably in white space. The "/" may appear between an entity and an attribute, following the period, but this case should be avoided where possible.

6.1.2 Aggregation symbols

If an attribute references an aggregate cardinality, and any single instance of the aggregate is of interest, brackets and the letter i "[i]" are used to indicate this. The use of "[n]" (where n is an integer) indicates that member n of the aggregate is of interest in the mapping. In order to limit the number of elements in an instantiation of the aggregation, rules must be written in the short form of the AIM. In the mapping of the Drawing to Approval assertion in annex B, the attribute **approved_items** is a set that references the select type **approved_item**.

6.1.3 Equal sign

An equal sign "=" is used in the reference path specification to indicate a member of a select list, an enumerated item of an enumerated list, or a specific value for an attribute. In the case of a select list, the name of the select type appears first followed on the same line by the equal sign and the member that is being selected. In the case of an enumerated list, the name of the enumeration type appears first followed on the same line by the equal sign and the enumerated item. In the case of a specific value, the attribute name appears first followed on the same line by the equal sign and the value assigned to the attribute.

See the mapping of the Date attribute of the Approval object in annex B. In this reference path specification, the attribute **date_time** references the select type **date_time_select**. For this mapping, the selection is a **date**. As seen in this example, the name of the select type appears on the line before the line containing the equal sign, and the selected member appears on the line following the line containing the equal sign. The order of these lines is reversed for a reference path in which the selected member is referenced first in the path. See the mapping of the Drawing to Approval assertion in the example in annex B. In this mapping, the reference path encounters **drawing_revision** first, which is the selected member of the **approved_item** select type.

6.1.4 Parentheses

Parentheses “()” are used to indicate the existence of options in the reference path. Each option is enclosed by a set of parentheses. The parentheses are used to indicate that a mapping has multiple reference paths or sections of the reference path. There are two reasons that the reference path may diverge: an object is mapped to multiple AIM entities or the reference path depends on the instantiation of the AIM. To aid understanding, the optional sections of the path may be numbered and a description provided, with the application object, that gives the reason for the divergence.

See the mapping of the Approval to Organization assertion in annex B. In this example, it is necessary to show the reference paths for each of the AIM elements to which the Organization maps.

6.1.5 Square brackets

Square brackets “[]” are used to indicate two or more required sections of the reference path. The square brackets indicate that there are either multiple mappings or multiple paths required to satisfy the mapping. Each mapping or path is enclosed by a set of square brackets. To fully document how the requirements are satisfied by the mapping, sections of the path may be numbered and a description giving the reason for the divergence may be provided in the Application element column.

See the mapping of the Annotation_subfigure_definition to 2D_cartesian_coordinate_space assertion in the example in **Figure 4**. This example shows that every **representation_context** that satisfies the requirements of the application object 2D_cartesian_coordinate_space must be both a **geometric_representation_context** and a **global_unit_assigned_context**. See the mapping of the Organization_name attribute of Organization in annex B. Where the mapping is to a person within an organization, both reference paths shown are required.

6.1.6 Braces

Braces “{ }” are used to indicate constraints placed on the mapping. This notation is used when the reference path specification would not normally contain AIM entities which are crucial to the mapping. Braces may be used to include into the reference path specification required supertypes or subtypes, required values assigned to attributes, or AIC entities containing rules that constrain the mapping. See the mapping of the Structured_dimension_callout to Draughting_callout assertion in the example in **Figure 3**. In this example, the reference path specification would not normally show the part 201 created subtype. However, for this mapping, the only **draughting_callout_relationship** that satisfies the information requirement is the **dimension_callout_component_relationship** subtype. The second usage of the braces in the reference path

specification indicates that the name of the relationship is restricted for this mapping to have the value “prefix”.

Braces are also used if an assertion is mapped to a specialization of a resource entity and the reference path specification would not otherwise show the resource entity. The inclusion of these AIM elements is intended to satisfy the requirement that all mappings to a specialized entity must have a reference path to a resource entity.

6.2 Application objects

A reference path specification is necessary for each application object that is mapped to a specialization of an integrated resource entity. The reference path starts with the AIM element to which the application object is mapped. It concludes at the integrated resource entity of which the specialization is a subtype. See the mapping of Drawing in annex B. In this example, Drawing is mapped to **draughting_drawing_revision**, which is a subtype of **drawing_revision** in ISO 10303-101:1994 (part 101). The reference path contains these two entities.

A reference path can also be shown to clarify a restriction on the mapping. See the mapping of Annotation_-subfigure_definition in the example in Figure 4. This object maps to an entity in the integrated resources; therefore, no reference path specification is required. However, to satisfy the requirements for this mapping, the inherited attribute **mapped_representation** must be of type **draughting_subfigure_representation**. This restriction is shown by including this portion of the reference path specification within braces.

6.3 Application attributes

There are different mappings of an attribute that must be considered for the documentation of the reference path. An attribute may be mapped to an attribute of the same AIM entity to which the application object is mapped. In this case, no reference path is necessary for the attribute. See the mapping of the Description attribute of Approval in the example in annex B.

An attribute may be mapped to an attribute of an entity different from the one to which the application object is mapped. The reference path for the attribute starts with the AIM element to which the application object is mapped. The path follows the entities and attributes of the AIM to the AIM attribute to which the application attribute is mapped. See the mapping of the Drawing_number attribute of Drawing in the example in annex B. In this example, Drawing is mapped to **draughting_drawing_revision** so the reference path of Drawing_number begins with this entity. **Drawing_revision** has an attribute **drawing_identifier** that references the entity **drawing_definition**. The **drawing_definition** entity has an attribute **drawing_number** to which the drawing_number attribute is being mapped.

6.4 Application assertions

Application assertions specify the relationships between pairs of application objects, the cardinality of the relationships, and the rules required for the integrity and validity of the application objects.

Application element	AIM element	Source	Reference path
ANNOTATION_SUBFIGURE_DEFINITION	symbol_representation_map	46	symbol_representation_map {<= representation_map.mapped_representation -> representation => symbol_representation => draughting_subfigure_representation}
annotation_subfigure_definition to 2d_cartesian_coordinate_space	PATH		symbol_representation_map {<= representation_map.mapped_representation -> representation {=> symbol_representation => draughting_subfigure_representation} representation.context_of_items -> representation_context => [geometric_representation_context] [global_unit_assigned_context]}
2D_CARTESIAN_COORDINATE_SPACE	[geometric_representation_context] [global_unit_assigned_context]	42 41	

Figure 4 - Example of multiple mappings

Application element	AIM element	Source	Reference path
STRUCTURED_DIMENSION_CALLOUT	structured_dimension_callout	201	structured_dimension_callout {<= draughting_callout
structured_dimension_callout to draughting_callout (as prefix)	PATH		structured_dimension_callout {<- draughting_callout.relationship.relativing_dimension_callout {<= dimension_callout_component_relationship} {draughting_callout_relationship.name = 'prefix'} draughting_callout_relationship.related_draughting_callout -> draughting_callout}
DRAUGHTING_CALLOUT	draughting_callout	101	

Figure 5 - Example of braces

The reference path of an assertion starts with the AIM element to which the first application object is mapped. The path concludes at the AIM element to which the second application object in the assertion is mapped. See the mapping of the Drawing to Approval assertion in annex B. In this example, Drawing is mapped to **draughting_drawing_revision** so the reference path of the assertion begins with this entity. **Drawing-revision** is one of the **approved_items** to which **approval** is assigned.

If the AIM element column contains the words “IDENTICAL MAPPING”, no reference path specification is required.

In rare cases, an application assertion may map to an AIM entity or attribute. In these cases, the mapping may be to an attribute in the reference path that connects the two identified application objects, or to an AIM entity that acts as the intersection entity connecting the two identified application objects. This attribute or entity is selected for the AIM element column with agreement by the AIM interpretation committee. The source column contains the number of the part containing this entity or attribute.

6.5 AIC considerations

AICs define “root node” entities where global rules pertaining to the AIC have been localized. If the root node of the AIC includes restrictions that apply to the mapping, the root node shall be included in the reference path specification to indicate this, even if the inclusion is only with the braces notation.

Annex A

Example information requirements

This annex contains the normative descriptions of the UoF, the application objects, and the application assertions for the example. These descriptions are extracted from clause 4 of ISO 10303-201:1994. Some objects, attributes, and assertions from the UoF have been excluded from the example.

4.1 Units of functionality

4.1.4 drawing_structure_and_administration

The drawing_structure_and_administration UoF contains information about the hierarchical organization of drawings, drawing sheets, and drawing views, together with the administrative information necessary to manage drawings and drawing sheets. Drawing sheets and drawing views are defined in their specific coordinate space. Annotation may be assigned to each drawing sheet and drawing view. The administrative information supports the exchange of drawings between environments in which configuration management of drawings is used. The following application objects are used by drawing_structure_and_administration UoF:

- Approval;
- Drawing;
- Drawing_sheet;
- Organization.

4.2 Application objects

4.2.13 Approval

An Approval is information that indicates a drawing, drawing sheet, or both have been reviewed for data content and for correctness of the presentation of that data and has been found to be acceptable. The data associated with an Approval are the following:

- Date;
- Description.

4.2.19.1 Date

The Date specifies the date on which the approval was assigned.

4.2.19.2 Description

The Description specifies the organization-specific release status or the authorized modifications for the revision of the drawing, drawing sheet, or both.

4.2.30 Drawing

A Drawing is the presentation of product data in a human-interpretable form wherein the physical and functional requirements for that product are presented pictorially and textually. The data associated with a Drawing are the following:

- Drawing_number;
- Drawing_revision_id.

4.2.30.2 Drawing_number

The Drawing_number specifies the identification of a particular drawing by an organization.

4.2.30.3 Drawing_revision_id

The Drawing_revision_id specifies the identification of a particular version of the drawing.

4.2.31 Drawing_sheet

A Drawing_sheet is a logical division of a drawing into a two-dimensional area for the presentation of product data. These divisions correspond to sheet paper sizes for plotting. A Drawing_sheet contains at least one Drawing_view or one Draughting_annotation. The data associated with a Drawing_sheet are the following:

- Sheet_number;
- Sheet_revision_id.

4.2.31.2 Sheet_number

The Sheet_number specifies the page number for a particular drawing sheet and its location in relation to other sheets of the drawing.

4.2.31.3 Sheet_revision_id

The Sheet_revision_id specifies the identification of a particular version of the drawing sheet.

4.2.57 Organization

An Organization is a number of persons or groups that designs, produces and supplies products and services. The data associated with an Organization are the following:

- Organization_name.

4.2.57.2 Organization_name

The Organization_name specifies the identification of a particular organization.

4.3 Application assertions

4.3.18 Approval to Organization

Each Approval is provided by one or more Organization objects. Each Organization provides zero, one, or many Approval objects.

4.3.32 Drawing to Approval

Each Drawing is governed by zero, one, or many Approval objects. Each Approval governs zero or one Drawing.

4.3.33 Drawing to Drawing_sheet

Each Drawing consists of one or more Drawing_sheet objects. Each Drawing_sheet belongs to exactly one Drawing.

4.3.37 Drawing_sheet to Approval

Each Drawing_sheet is governed by zero, one, or many Approval objects. Each Approval governs zero, one, or many Drawing_sheet objects.

Annex B

Example mapping table

This annex contains the mapping table of the UoF, the application objects, and the application assertions for the example. See annex A for the normative descriptions of the application objects.

The AIM entities found in this mapping table are defined in ISO 10303-41:1994, ISO 10303-101:1994 and ISO 10303-201:1994.

Table 4 - Mapping table for drawing_structure_and_administration

Application element	AIM element	Source	Rules	Reference path
APPROVAL				
date	approval calendar_date	41 41		approval <- approval_date.time.dated_approval approval_date.time approval_date.time.date.time -> date.time_select date.time_select = date date => calendar_date
description	approval.level PATH	41		approval <- approval_person.organization.authorized_approval approval_person.organization approval_person.organization.person.organization -> person.organization_select #1 (person.organization_select = person person) #2 (person.organization_select = organization organization) #3 (person.organization_select = person_and_organization person_and_organization)
DRAWING				
drawing_number	draughting_drawing_revision drawing_definition. drawing_number	201 101		draughting_drawing_revision <= drawing_revision draughting_drawing_revision <= drawing_revision drawing_revision.drawing_identifier -> drawing_definition drawing_definition.drawing_number

Table 4 - Mapping table for drawing_structure_and_administration (continued)

Application element	AIM element	Source	Rules	Reference path
drawing_revision_id	drawing_revision. revision_identifier	101		draughting_drawing_revision <= drawing_revision drawing_revision.revision_identifier
drawing to approval	PATH			draughting_drawing_revision <= drawing_revision approved_item = drawing_revision approved_item <= draughting_approval_assignment.approved_items[i] draughting_approval_assignment <= approval_assignment approval_assignment.assigned_approval -> approval
drawing to drawing_sheet	PATH			draughting_drawing_revision <= drawing_revision <= presentation_set <= area_in_set.in_set area_in_set (=> drawing_sheet_revision_usage) area_in_set.area -> presentation_area => drawing_sheet_revision
DRAWING_SHEET	drawing_sheet_revision	101		
sheet_number	drawing_sheet_revision_usage. sheet_number	101		drawing_sheet_revision <= presentation_area <= area_in_set.area area_in_set => drawing_sheet_revision_usage drawing_sheet_revision_usage.sheet_number
sheet_revision_id	drawing_sheet_revision. revision_identifier	101		

Table 4: Mapping table for drawing_structure_and_administration (concluded)

Application element	AIM element	Source	Rules	Reference path
drawing_sheet to approval	PATH			drawing_sheet_revision approved_item = drawing_sheet_revision approved_item <- draughting_approval_assignment.approved_items[i] draughting_approval_assignment approval_assignment.assigned_approval -> approval
ORGANIZATION	(person) (organization) (person_and_organization)	41 41 41		
organization_name #1: If the organization is only a person #2: If the organization is only an organization #3: If the organization is a person within an organization	#1 (person.id) #2 (organization.name) #3 ([person.id] [organization.name])	41 41 41 41		#3 (person_and_organization [person_and_organization.the_person -> person person.id] [person_and_organization.the_organization -> organization organization.name])

Annex C

Bibliography

1. ISO 10303-11:1994, *Industrial automation systems and integration — Product data representation and exchange — Part 11: Description methods: The EXPRESS language reference manual*.
2. ISO 10303-41:1994, *Industrial automation systems and integration — Product data representation and exchange — Part 41: Integrated generic resources: Fundamentals of product description and support*.
3. ISO 10303-101:1994, *Industrial automation systems and integration — Product data representation and exchange — Part 101: Integrated application resources: Draughting*.
4. ISO 10303-201:1994, *Industrial automation systems and integration — Product data representation and exchange — Part 201: Application protocols: Explicit draughting*.
5. Palmer, M.; *Guidelines for the development and approval of STEP application protocols*, ISO TC184/SC4 WG4 N508, June 1995.
6. *Supplementary directives for the drafting and presentation of ISO 10303*, ISO TC184/SC4 Editing committee document N48, March 1995.

Annex D

Mapping table issues

- Issue 1. Mapping table syntax, particularly the reference path, should be made more formal to facilitate software support for mappings. The development of a formalized syntax for mapping tables should be considered. A mapping table language that has been developed by Industrial Technology Institute of Ann Arbor, Michigan could be evaluated and adapted.
- Issue 2. The use of numbered alternatives in mapping tables should be clarified. They are often used to clarify the need for multiple mappings, but there are no guidelines governing their use.

